

**Evaluation of Bag Limits and Seasonal Closures for the Recreational
Red Snapper Fishery Under a 16-inch Minimum Size Limit
NOAA Fisheries Service
Southeast Regional Office
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Introduction

The Gulf of Mexico Fishery Management Council (Council) is currently developing joint Amendment 14/27 to the Shrimp and Reef Fish Fishery Management Plans (FMP). This amendment is intended to revise the rebuilding plan for red snapper adopted in Amendment 22 to the Reef Fish FMP (GMFMC 2004). Major actions in the amendment include reducing directed fishery bycatch of red snapper, capping shrimp effort, revising certification criteria for bycatch reduction devices, and adjusting the total allowable catch (TAC) for red snapper beginning in 2007. The Council is considering reducing the current TAC of 9.12 million pounds (mp) whole weight (status quo) to 7 or 5 mp whole weight (Table 1) from 2007 through 2012. This report evaluates various bag limits and seasonal closures that could be used to reduce recreational harvest of red snapper. All analyses assume the minimum size limit would remain at 16 inches total length (TL). If the Council decides to reduce the minimum size limit for red snapper, additional bag and seasonal closures analyses will be needed. Options for reducing commercial harvest are not considered in this report; however, the Council is considering reducing the commercial quota (see Table 1).

Table 1. Proposed red snapper TAC levels and quotas being considered in Amendment 14/27 and their corresponding reductions in harvest.

TAC	Quota		Harvest Reduction
	Commercial	Recreational	
9.12	4.65	4.47	0%
7.0	3.57	3.43	23%
5.0	2.55	2.45	45%

Directed Fishery Regulations

The red snapper fishery is currently regulated to achieve a 9.12 mp TAC. The TAC is divided into a 4.65 mp commercial quota and a 4.47 mp recreational quota. Recreational fishery restrictions include a four fish per person daily bag limit, a 16-inch TL minimum size limit, and a seasonal closure in federal waters from November 1-April 20. Commercial fishery regulations include trip limits, monthly seasonal closures, license limitation, and a 15-inch TL minimum size limit. An individual fishing quota (IFQ) program for the commercial fishery was approved by the Council in March 2006 and could be implemented as early as 2007. If an IFQ program is implemented, trip limits and seasonal closures would be eliminated and the amount of red snapper fishermen could harvest would be restricted to the number of IFQ shares they possess.

Methods

Data Sources

Recreational landings data for Gulf of Mexico red snapper were obtained from the NOAA Fisheries Service Marine Recreational Fisheries Statistics Survey (MRFSS), the NOAA Fisheries Service For-Hire Survey (FHS), the Southeast Fishery Science Center Headboat Survey, and the Texas Parks and Wildlife Department (TPWD) Recreational Fishing Survey. MRFSS intercept files, FHS intercept files, and headboat catch-effort files (2003-2004) were used to evaluate reductions in fishing mortality associated with various red snapper bag limits. TPWD catch-effort files were also examined for bag limit analyses, but were not used because effort estimates (number of anglers contributing to catch) were relatively low for many intercepts resulting in very high catch rates (> 5 red snapper per angler per trip) for many trips (Figure 1). Thirty-one percent of TPWD private vessel intercepts reported greater than 10 red snapper per angler per trip in comparison to 0 percent of MRFSS trips. Similarly, 4.4 percent of TPWD charter vessel intercepts reported greater than 10 red snapper per angler per trip in comparison to only 0.1 percent (1 out of 1675 intercepts) of MRFSS intercepts. MRFSS, headboat, and TPWD catch estimate files were used to calculate landings and discards (numbers of fish) by wave or month for closed season analyses. Landings data from the last three years of the stock assessment (2001-03) were used for all closed season analyses.

Bag Limit Analyses

The MRFSS system classifies recreational catch into three categories:

- Type A - Fish that were caught, landed whole, and available for identification and enumeration by the interviewers.
- Type B - Fish that were caught but were either not kept or kept but not available for identification.
 - Type B1 - Fish that were caught and filleted, released dead, given away, or disposed of in some way other than Types A or B2.
 - Type B2 - Fish that were caught and released alive.

Type A, B1, and B2 catches were used for bag limit analyses. All catch types A, B1, and B2 were recorded on a per-person basis. Type A catch represents the total catch of all anglers on a fishing trip. However, some or all of the anglers contributing to the A catch are also interviewed to report type B1 and B2 catch, and those may be recorded on an individual basis. If the number of people contributing to the A catch was greater than the number of people interviewed to report B1 or B2 catch, the following formulas were used to account for possible under reporting of the B1 and B2 catch:

$$B1 = B1_{\text{interviewed}} \times (\# \text{ people in fishing party} / \# \text{ people interviewed to report B1 catch})$$

$$B2 = B2_{\text{interviewed}} \times (\# \text{ people in fishing party} / \# \text{ people interviewed to report B2 catch})$$

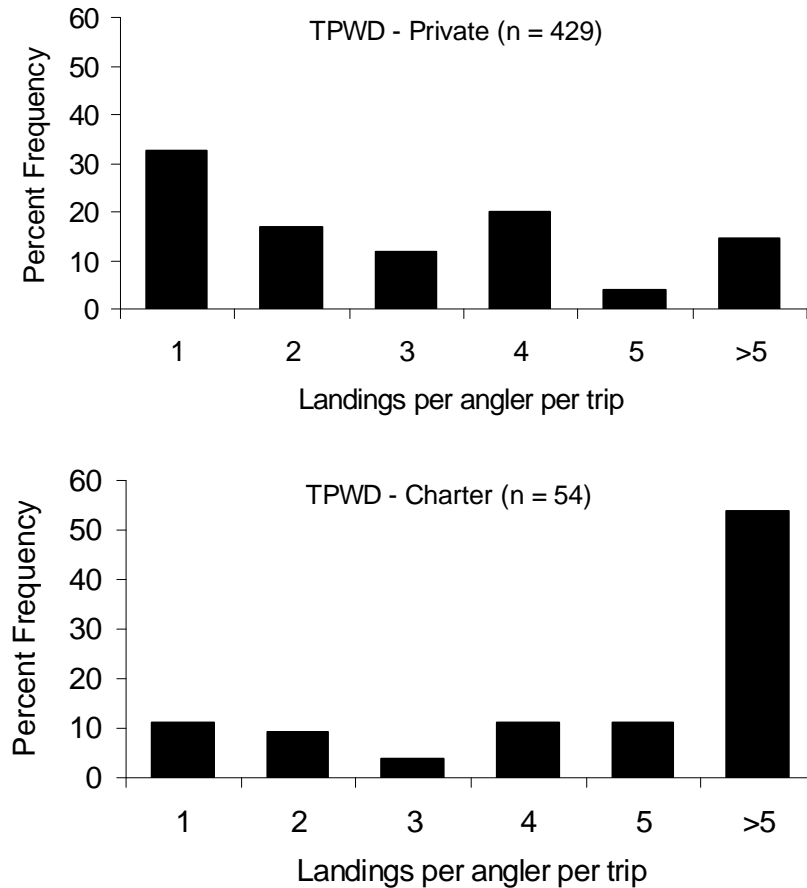


Figure 1. Frequency distribution of landings per angler per trip for 2003-2004 TPWD recreational angler intercepts by mode (private, charter). Landings per angler per trip are categorized as follows: 1 = 0.01-1.0 red snapper per angler per trip, 2 = 1.01 – 2.0 red snapper per angler per trip, etc.

Percent reductions in fishing mortality were estimated for bag limits ranging from one to four (status quo) red snapper. To estimate the impacts of various bag limits, MRFSS type A + B1 (AB1) catch was divided by the number of people contributing to the catch to estimate the average catch per person. If AB1 catch per person was greater than the bag limit being analyzed, the value was re-set to the bag limit ($AB1_{\text{bag limit}}$), otherwise no changes to catch were made. To estimate discard mortality, a proportion of B2 catch was added to the AB1 catch to account for release mortality (r). Additionally, the difference between AB1 and $AB1_{\text{bag limit}}$ was multiplied by the same release mortality used for B2 catch to account for release mortality that would be experienced with more restrictive bag limits. A 40 percent release mortality rate was used for red snapper harvested in the western Gulf (Texas and Louisiana) and a 15 percent release mortality rate was used for red snapper harvested in the eastern Gulf (Mississippi, Alabama, and Florida) (SEDAR 2005).

The following formulas were used to estimate total fishing mortality resulting from various bag limits:

If AB1 catch \leq bag limit, then total fishing mortality = $AB1 + r(B2)$

If AB1 catch $>$ bag limit, then total fishing mortality = $AB1_{\text{bag limit}} + r((AB1 - AB1_{\text{bag limit}}) + B2)$

Total fishing mortality for headboat bag limits was calculated in a similar manner except no data were available for released fish or fish unavailable for identification. Catch per person was calculated by dividing the total number of fish landed by the number of anglers. If the catch per angler was greater than the bag limit being analyzed ($A_{\text{bag limit}}$), the value was re-set to the bag limit, as described above. If the catch per angler was less than the bag limit being analyzed, then no changes to the catch were made. To estimate mortality due to fishing, the difference between A catch and $A_{\text{bag limit}}$ was multiplied by the regional release mortality rate and added to the A catch.

To examine the influence of different sectors within the recreational fishery, reductions in fishing mortality were estimated by mode (charter, private, headboat) and region (western and eastern Gulf) by dividing the total catch (including dead discards) exceeding a particular bag limit by average landings. Reductions were adjusted to account for non-compliance (i.e., exceeding red snapper bag limit) and retention of bag limits by captain and crew by subtracting the reduction associated with a four fish bag limit from the reductions associated with lower bag limits (Note: lower bag limits could result in greater rates of non-compliance or increased numbers of red snapper being retained by captain and crew; this analysis assumes compliance and retention rates would be constant if more restrictive regulations are imposed). Reductions were then weighted by mode and region using red snapper landings data in Table 2.

Table 2. Percentage of annual red snapper landings by mode and region, 2001-2003.

Year	Charter		Private		Headboat	
	East	West	East	West	East	West
2001	35.1	4.8	36.5	8.5	4.6	10.5
2002	40.5	3.5	35.7	4.7	5.4	10.0
2003	35.6	6.2	34.6	6.1	5.4	12.0
2001-03 avg	37.1	4.9	35.6	6.4	5.2	10.8

Seasonal Closure Analyses

Various season closures were examined by adjusting either the start date or the end date of the current federal fishing season (April 21-October 31). The start or end of the season was adjusted in increments of 10, 15, or 16 days to determine overall reductions in harvest. Reductions in fishing mortality resulting from changes to the season length did not account for effort shifting, or potential increases in state water landings (e.g., Texas state waters) due to the longer closed season. However, reductions in landings due to the extended seasonal closure did consider the impacts of release mortality. Two release mortality scenarios were evaluated: 1) all red snapper landed when the fishery was open would be caught and released during the new closed season and survive (0 percent release mortality scenario) and 2) 85 percent of eastern Gulf red snapper and 60 percent of western Gulf red snapper landed when the fishery was previously open would be caught and released during the new closed season and survive. Likely, the true reduction in

harvest during the longer seasonal closure will lie between these two scenarios, since anglers will target other species and likely discard less red snapper during the new closure period than were previously landed when the fishery was open. Therefore, these results should be viewed as minimum and maximum values for reducing harvest.

Average recreational landings in numbers of fish were summarized by either month (headboat data) or wave (MRFSS and TPWD data) for the years 2001-2003. MRFSS and TPWD landings by wave were then partitioned into monthly landings by multiplying wave landings by the percentage of days accounted for by each month during the two-month wave. April landings for all modes were further adjusted to account for landings occurring before and after April 21, since Texas state waters are open year-round and the recreational fishing season in Florida state waters opens April 15. Landings before and after April 21 were estimated as follows:

1. Headboat landings from April 1-20 were set equal to the average monthly headboat landings during January-March. These average landings were then multiplied by 0.666 (20/30 days) to account for landings only during the first 20 days of the month. Landings from April 21-30 were estimated by subtracting estimated headboat landings for April 1-20 from total estimated April headboat landings.
2. MRFSS landings for Alabama, Mississippi, and Louisiana were set equal to zero prior to April 21 since no landings occurred in these states during wave-1). MRFSS landings for Florida were set equal to zero from March 1-April 14 when the fishery is closed. MRFSS landings for the state of Florida from April 15-20 were estimated by multiplying the total estimated landings from Florida state waters during wave 2 by 0.4 (6/15 days). MRFSS landings for Florida from April 21-30 were estimated by subtracting Florida state water landings from April 15-20 from total estimated MRFSS landings for Florida during wave 2.
3. TPWD charter and private vessel state water landings for wave 2 were distributed equally for March (31 days), April 1-20 (20 days), and April 21-30 (10 days) based on the number of fishing days within each time interval. Catch rates were assumed to be constant for the entire two-month wave. All federal water landings were assumed to occur from April 21-30.

Reductions in landings were estimated using the following formula:

$$\text{Percent reduction} = ((y - b) * (1 - r)) / y,$$

where:

b = average estimated red snapper landings during the proposed open season plus landings from November 1 – April 20;

y = average red snapper landings, 2001-2003;

r = release mortality (0.0, 0.15 {eastern Gulf}, or 0.40 {western Gulf}).

Combination Analyses

Combination analyses were also conducted to investigate the effects of reducing the red snapper bag limit and extending the red snapper closed season. The following equation was used to estimate reductions in fishing mortality:

$$\text{Percent reduction} = (((y - b) * (1 - r)) + (c \times x)) / y,$$

where:

b = estimated red snapper landings during the proposed open season plus landings from November 1 – April 20

c = average red snapper landings during the proposed open season

x = percent reduction for various red snapper bag limits (r = 0.15 in eastern Gulf and 0.40 in western Gulf)

y = average red snapper landings, 2001-2003

Results

Bag Limits

Table 3 summarizes mean and median catch rates by mode and region. Catch rates were greater in the western Gulf than in the eastern Gulf for all modes (Table 3). The mean number of fish released per angler was similar for all modes and regions, ranging from 2.9 to 3.6 red snapper released per trip (Table 3). Catch rates were greater for charterboats and headboats than private vessels. In general, private boat anglers on average landed approximately 50 percent less red snapper per trip than charterboat anglers.

Table 3. Summary statistics of red snapper catches by mode and region. A_per and catch_per refer to the mean number of fish landed per angler, B1_per is the mean unobserved catch per angler, and B2_per is the number of fish released per angler.

Mode	Variable	Mean	Median	Min	Max	Std Dev
Charter - East	A_per	2.45	2.00	0	11.00	2.11
	B1_per	0.02	0.00	0	5.50	0.24
	B2_per	2.94	2.32	0	20.00	2.69
Charter - West	A_per	2.79	2.67	0	8.00	2.10
	B1_per	0.01	0.00	0	1.75	0.13
	B2_per	3.60	3.00	0	21.10	3.24
Private - East	A_per	0.90	0.46	0	6.00	1.24
	B1_per	0.08	0.00	0	4.50	0.47
	B2_per	3.46	2.00	0	50.00	5.58
Private - West	A_per	1.41	0.67	0	8.00	1.59
	B1_per	0.04	0.00	0	3.50	0.32
	B2_per	3.52	2.00	0	24.00	4.12
Headboat - East	Catch_per	1.27	0.77	0	10.42	1.31
Headboat - West	Catch_per	2.39	2.37	0	40.00	1.66

Reductions in fishing mortality for a three, two, or one fish bag limit are summarized in Table 4. Reductions were greatest for charter vessels and similar for private vessels and headboats. A three fish bag limit would reduce fishing mortality by 7 percent, a two fish bag limit would reduce fishing mortality by 17 percent, and one fish bag limit would reduce fishing mortality by 32 percent. These reductions assume a 15 percent release mortality rate in the eastern Gulf of Mexico and a 40 percent release mortality rate in the western Gulf of Mexico. For purposes of comparison, reductions were also estimated assuming a zero percent release mortality rate. Corresponding reductions for a three, two, or one fish bag limit assuming zero release mortality are 11, 28, and 52 percent respectively.

Table 4. Estimated reductions in red snapper fishing mortality for various bag limits by region, release mortality rate (r), and mode.

Mode	Bag Limit	Eastern Gulf		Western Gulf		Gulfwide	
		r = 0.0	r = 0.15	r = 0.0	r = 0.4	r = 0.0	r = 0.15, 0.4
Charter	3	13	10	15	6	14	9
	2	32	23	34	13	32	22
	1	56	40	59	23	57	38
Private	3	9	5	12	4	9	5
	2	23	14	30	9	24	13
	1	46	27	58	18	48	26
Headboat	3	5	4	10	6	8	5
	2	15	13	29	17	24	16
	1	42	35	58	35	52	35
All Modes	3	11	7	12	5	11	7
	2	27	18	30	14	28	17
	1	51	34	58	27	52	32

Seasonal Closure

Red snapper landings are greatest in May, shortly after the red snapper season opens (Figure 1). Landings decline from July to September and increase slightly in October, when the season closes (Figure 2). A small percentage of landings occur from November 1 – April 21 due to state waters remaining open in Texas and the recreational red snapper season opening in Florida state waters six days prior to the federal season. Landings in April, May, and October account for 8, 19, and 11 percent of the annual recreational landings, respectively. Landings during November through March account for approximately 1.2 percent of annual red snapper landings.

Table 5 summarizes estimated reductions in harvest resulting from various seasonal closures. Greater reductions in harvest occur if the season starts later, rather than ends earlier. This is because landings in April, May, and June are greater than landings during September and October (Figure 2). Closing the fishery in April and/or May allows for a longer fishing season than if the fishery is closed in September and/or October. In general, the fishing season would need to be shortened by approximately two months or more to meet a 3.43 mp quota (7.0 mp TAC), without changing the bag limit (= 4). Longer closures would be necessary

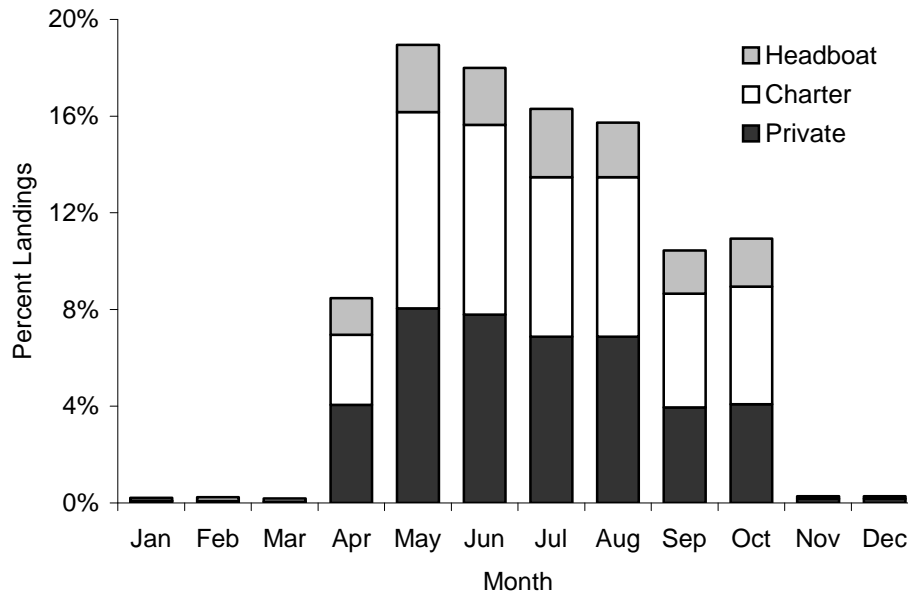


Figure 2. Frequency distribution of Gulf of Mexico red snapper landings by mode and month, 2001-2003.

to achieve lower quotas if the bag limit remains at four. Actual reductions in harvest resulting from various seasonal closures and release mortality rates likely lie between the range of values presented in Table 3. However, because it is unknown how many red snapper would be released during new closure periods, a range of values is provided. This range is intended to bracket the upper and lower range of reductions expected to occur.

Combination Analyses

Tables 6 and 7 and Figures 3 and 4 summarize reductions in harvest resulting from various combinations of bag limits, seasonal closures, and release mortality rates. As expected, lower bag limits combined with shorter seasons and lower release mortality rates result in the greatest reductions in harvest. Similar to the seasonal closure reductions summarized in Table 5, reductions resulting from various bag limits and seasonal closures are expected to be between the range of values presented in Tables 6 and 7.

Discussion

The results of these analyses are dependent on several assumptions, which may affect the overall results summarized in this report. Assumptions include:

- 1) 2003-2004 catch rates are similar to future catch rates;
- 2) the distribution of landings during 2001-03 is similar to future distributions of landings;
- 3) no effort shifting occurs between months if the fishing season is shortened;

Table 5. Estimated Gulfwide reductions in red snapper fishing mortality for various seasonal closures and release mortality rates. r = release mortality rate; a release mortality rate of 0.15 was used for the eastern Gulf and a release mortality rate of 0.4 was used for the western Gulf.

Open Season	Days Open	Percent Reduction	
		$r = 0.15, 0.40$	$r = 0.0$
Apr 21 - Oct 31	194	0	0
Apr 21 - Oct 15	178	6	4
May 1 - Oct 31	184	8	6
Apr 21 - Sept 30	163	11	9
May 1 - Oct 15	168	13	12
Apr 21 - Sept 15	148	16	13
May 15 - Oct 31	169	17	15
May 1 - Sept 30	153	19	15
Apr 21 - Aug 31	133	21	17
May 15 - Oct 15	153	22	19
May 1 - Sept 15	138	24	19
Jun 1 - Oct 31	153	27	21
May 15 - Sept 30	138	28	24
May 1 - Aug 31	123	29	23
Apr 21 - Aug 15	117	29	22
Jun 1 - Oct 15	137	32	26
May 15 - Sept 15	123	33	28
May 1 - Aug 15	107	37	29
Jun 1 - Sept 30	122	37	30
Apr 21 - July 31	102	37	26
May 15 - Aug 31	108	38	32
Jun 1 - Sept 15	107	42	34
May 1 - July 31	92	45	35
May 15 - Aug 15	92	46	38
Jun 1 - Aug 31	92	48	39
May 1 - July 15	76	53	42
May 15 - July 31	77	54	44
Jun 1 - Aug 15	76	56	44

Table 6. Estimated Gulfwide reductions in red snapper fishing mortality for various combinations of bag limits and open seasons. Reductions are for all modes combined. Bag limit and seasonal closure analyses assumed a 15 percent release mortality rate in the eastern Gulf and a 40 percent release mortality rate in the western Gulf.

Open Season	Days Open	Bag Limit		
		3	2	1
Apr 21 - Oct 31	194	7	17	32
Apr 21 - Oct 15	178	11	21	36
May 1 - Oct 31	184	13	22	37
Apr 21 - Sept 30	163	15	24	38
May 1 - Oct 15	168	18	27	41
Apr 21 - Sept 15	148	19	28	41
May 1 - Sept 30	153	21	29	42
May 15 - Oct 31	169	21	30	43
Apr 21 - Aug 31	133	23	31	44
May 1 - Sept 15	138	25	33	45
May 15 - Oct 15	153	25	33	45
Jun 1 - Oct 31	153	27	35	47
Apr 21 - Aug 15	117	27	35	47
May 1 - Aug 31	123	28	36	48
May 15 - Sept 30	138	29	37	48
Jun 1 - Oct 15	137	31	39	50
Apr 21 - July 31	102	31	39	50
May 15 - Sept 15	123	33	40	51
May 1 - Aug 15	107	34	41	52
Jun 1 - Sept 30	122	35	42	52
May 15 - Aug 31	108	37	44	54
Jun 1 - Sept 15	107	38	45	55
May 1 - July 31	92	40	46	56
May 15 - Aug 15	92	42	49	58
Jun 1 - Aug 31	92	43	49	58
May 1 - July 15	76	46	52	60
May 15 - July 31	77	48	54	62
Jun 1 - Aug 15	76	48	54	62

Table 7. Estimated Gulfwide reductions in red snapper fishing mortality for various combinations of bag limits and open seasons. Reductions are for all modes combined. Bag limit and closed season analyses assume no release mortality.

Open Season	Days Open	Bag Limit		
		3	2	1
Apr 21 - Oct 31	194	11	28	52
Apr 21 - Oct 15	178	16	32	55
May 1 - Oct 31	184	18	33	56
Apr 21 - Sept 30	163	21	36	58
May 1 - Oct 15	168	23	37	59
Apr 21 - Sept 15	148	25	39	60
May 15 - Oct 31	169	26	40	60
May 1 - Sept 30	153	28	41	61
Apr 21 - Aug 31	133	30	43	63
May 15 - Oct 15	153	31	44	63
May 1 - Sept 15	138	32	45	64
Jun 1 - Oct 31	153	35	47	65
May 15 - Sept 30	138	36	48	66
May 1 - Aug 31	123	37	49	66
Apr 21 - Aug 15	117	37	49	66
Jun 1 - Oct 15	137	40	51	68
May 15 - Sept 15	123	40	51	68
May 1 - Aug 15	107	44	54	70
Jun 1 - Sept 30	122	44	54	70
Apr 21 - July 31	102	44	54	70
May 15 - Aug 31	108	45	55	71
Jun 1 - Sept 15	107	49	58	73
May 1 - July 31	92	51	60	74
May 15 - Aug 15	92	52	61	74
Jun 1 - Aug 31	92	54	62	75
May 1 - July 15	76	58	66	77
May 15 - July 31	77	59	67	78
Jun 1 - Aug 15	76	60	68	79

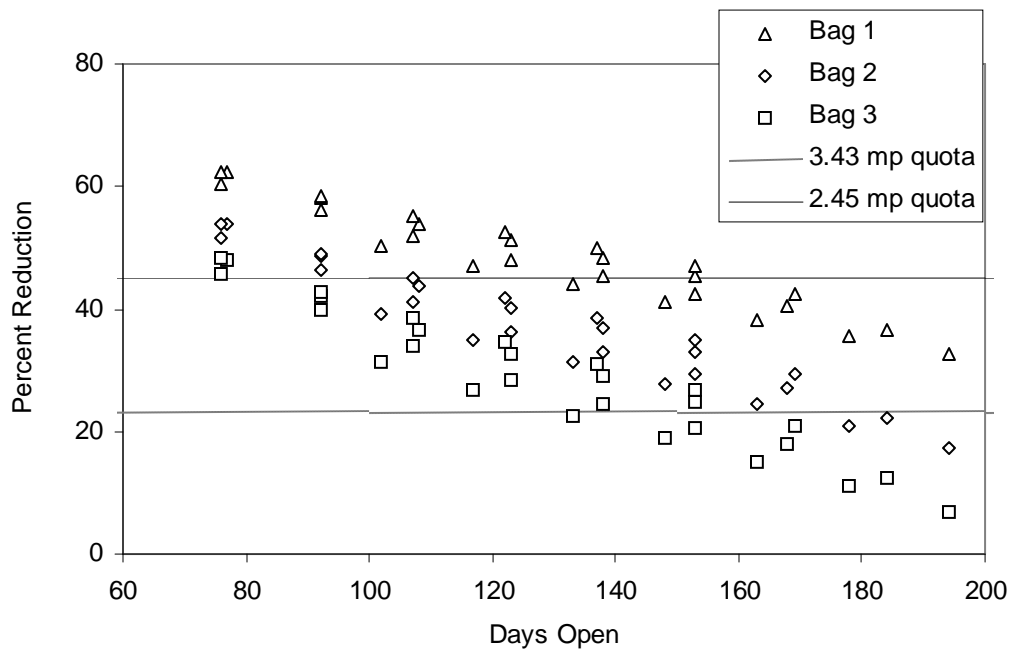


Figure 4. Plot summarizing the percent reductions in red snapper fishing mortality achieved for various season lengths (days open) and bag limits. Data points above each of the quota lines would achieve the minimum necessary reductions in harvest for that particular quota. Bag limit and seasonal closure analyses assume a 15 percent release mortality rate in the eastern Gulf and a 40 percent release mortality rate in the western Gulf.

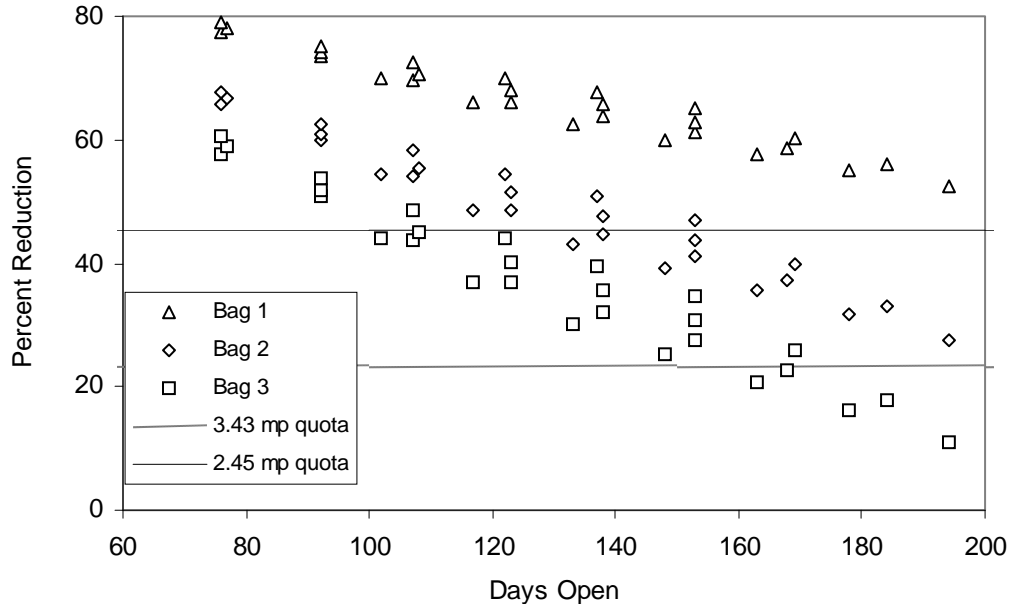


Figure 5. Plot summarizing the percent reductions in red snapper fishing mortality achieved for various season lengths (days open) and bag limits. Data points above each of the quota lines would achieve the minimum necessary reductions in harvest for that particular quota. Bag limit and closed season analyses assume no release mortality.

- 4) state water landings during the federal closed season do not significantly affect the overall seasonal closure reductions; and,
- 5) MRFSS catch rates from Louisiana are representative of catch rates from Texas.

Deviation from these assumptions could result in over- or underestimation of actual reductions. For instance, the estimated reductions in fishing mortality resulting from bag limits could be under or overestimated if catch rates increase or decrease. Similarly, different landings distributions could increase or decrease reductions resulting from shorter fishing seasons if more or less landings are attributed to months at the beginning or end of the fishing season. If effort shifting occurs, then the level of reduction resulting from a longer seasonal closure would be less. Also, as mentioned in the Methods section, harvest reductions resulting from seasonal closures may be slightly overestimated since they do not account for landings in state waters (Texas and Florida) when federal waters are closed. However, state water landings only account for a small fraction (~1 percent) of the harvest during the existing closed season (November 1 – April 21). Therefore, not accounting for state water landings should not significantly affect the overall reductions in harvest

Because TPWD charterboat sample sizes were small ($n = 54$) and numerous TPWD angler intercepts reported red snapper landing greater than the four fish bag limit, TPWD intercept data were not used for analyses. It was assumed MRFSS data from Louisiana was representative of catch rates from Texas. Although this may not be a valid assumption, the overall reductions estimated should not be greatly affected if catch rates are greater or less in Texas when compared to Louisiana. This is because, western Gulf charterboat and private vessel landings account for only a small portion of the overall Gulf-wide red snapper harvest (~11 percent) and charterboat and private vessel landings from Texas account for an even small proportion (~6 percent) of overall Gulf-wide red snapper landings. When reductions were weighted by mode based on the amount of landings accounted for by each mode, charter and private vessels in the eastern Gulf and headboats in the western Gulf had the greatest influence on estimated fishing mortality reductions.

This report used release mortality rates from the 2005 stock assessment, which were reviewed through the Southeast Data, Assessment, and Review process. These release mortality rates were determined to be based on the best available scientific information. As shown in this report, lower release mortality rates increase fishing mortality reductions and reduce the number of fish dying from release, whereas higher assumed release mortality rates reduce estimated fishing mortality reductions and increased the number of fish dying from release. It is unknown how many red snapper will be released if the fishing season is shortened. The results presented within this report provide a range of reductions, with actual reductions in harvest likely lying between the range of values presented.

Overall, the results of this report indicate there are several management measures that can be used to reduce fishing mortality of red snapper. This report did not attempt to analyze all of the alternatives currently under consideration by the Council. If the Council chooses to reduce the recreational minimum size limit, then additional analyses will be necessary. Reducing the minimum size limit will decrease discard mortality, but will likely increase the amount of fish available for harvest, therefore resulting in greater reductions in bag limits and seasonal closures

necessary to maintain landings within specified quota levels. Managers will need to consider the benefits of maintaining a longer fishing season and reducing discard mortality with the costs of reducing harvest through other means. Combinations of various management measures may be necessary to maintain a balance between reductions to the season length and restrictions on the amount of harvest.

References

GMFMC. 2004. Final Amendment 22 to the Reef Fish Fishery Management Plan to set red snapper Sustainable Fisheries Act targets and thresholds, set a rebuilding plan, and establish bycatch reporting methodologies for the reef fish fishery. GMFMC, Tampa, FL. 221 p.

SEDAR (Southeast Data, Assessment, and Review). 2005a. SEDAR 7 Gulf of Mexico red snapper complete stock assessment report. SEDAR, Charleston, South Carolina.